

The invention teaches a multi-step method for shutting down the dry-etch process. The ICP rf power is reduced between each of these consecutive power-down steps of the dry-etch process, the complete power-down sequence consists of six steps. These six steps are executed in sequence and without interruption and form the totality of the dry-etch chamber power-down procedure.

Claim rejections - 35 U.S.C. § 112

Reconsideration of the rejection of claims 1-3 and 5-6 under 35 U.S.C 102(b), as being anticipated by Blanchard et al. (US Patent 5,221,425) is respectfully requested based on the following.

Differences between Blanchard et al. and the instant invention have been highlighted in a response to a previous Office Action and can be summarized as follows:

- Blanchard et al. provide for a method for reducing foreign matter deposited on a wafer during reactive ion etching by following a procedure of reducing pressure in the chamber, by controlling the gas flow into the chamber, by de-activating the radio frequency voltage, by applying the reactive ion etching with magnetic enhancements, by deactivating the magnetic field applied to the chamber, all of these

conditions controlled and applied in a reactive ion etching process

- the instant invention provides for a method of reducing dry-etch cleaning chamber particle count at the end of power-down for a dry-etch chamber by following a dry-etch chamber power-down procedure
- the difference between Blanchard et al. and the instant invention is essentially clear from the above mentioned item, that is Blanchard et al. provides for reducing the deposition of foreign matter which is deposited on a wafer during RIE, the instant invention reduces particle count, not during or as part of RIE processing, but after the reactive chamber has been used for RIE processing and the reactive chamber is, as part of the invention, powered-down in such a manner that foreign particle count inside the chamber is reduced at the end of the power-down cycle
- to quote from the specification, page 4: "Using current one-step cleaning procedures results in a violent transition of the plasma in going from the operating condition of rf-on to rf-off
- the instant invention changes the conventional one-step cleaning process (page 5 of the specification and Figs. 1a through 1e of the specification), to a six step sequence of

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steps, the "power-down procedure" that is claimed in claims 1, 7, 8-13, 14,14 and 16 with the dependent claims thereto, also described using Figs. 2a through 2e of the specification, providing a method of reducing particle count within the dry-etch chamber at the end of the dry-etch chamber cleaning process.

In light of the foregoing response, applicant respectfully requests that the Examiner's rejection of claims 1-3 and 5-6 under 35 U.S.C 102(b) as being anticipated by Blanchard et al. (US Patent 5,221,425), be withdrawn.

Claim rejections - 35 U.S.C. § 103

Reconsideration of the rejection of claims 1-22 under 35 U.S.C 103(a) as being unpatentable over Blanchard et al. (US Patent 5,221,425) is respectfully requested based on the following.

The difference between Blanchard et al. and the instant invention has been argued supra and will therefore not be repeated at this time.

As stated above, the invention provides a method of cleaning dry-etch processing chambers that is suited for and aimed at ULSI technology, which is a technology that is considerably advanced from the technology that is addressed by Blanchard et al. Blanchard et al. do not address a power-down procedure but use power manipulation in the processing chamber to achieve reducing foreign matter on a wafer that is etched using a reactive ion etching process.

The instant invention provides very specific conditions for a power-down procedure including conditions of pressure, conditions of rf power supplied to the ICP coil of the dry-etch chamber, conditions of rf power supplied for the RIE etch, a particular gas (O_2) entered into the dry-etch chamber and a time during which each of the six steps of the power-down procedure of the invention is to remain in force; the time of the steps is also varied. Blanchard et al. provide optimum operating parameter during a reactive ion etching process, the instant invention provides control parameters (not cited by Blanchard et al.) which collectively are aimed at and achieve reducing particle count at the end of a power-down cycle.

In light of the foregoing response, applicant respectfully requests that the Examiner's rejection of claims 1-22 under 35

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U.S.C 103(a) as being unpatentable over Blanchard et al. (US Patent 5,221,425), be withdrawn.

Other Considerations

No new independent or dependent claims have been written as a result of this office action, no new charges are therefore incurred due to this office action.

SUMMARY

The invention teaches a multi-step method for shutting down the dry-etch process. The ICP rf power is reduced between each of these consecutive power-down steps of the dry-etch process, the complete power-down sequence consists of six steps. These six steps are executed in sequence and without interruption and form the totality of the dry-etch chamber power-down procedure.

It is requested that should Examiner not find the claims to be allowable that he call the undersigned Attorney at his convenience at 845-452-5863 to overcome any problems preventing allowance.

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Attached hereto is a marked-up version of the changes made to the specification and claims by the current amendment. The attached page is captioned:

"Version with markings to show changes made."

Respectfully submitted,



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Version with markings to show changes made

IN THE CLAIMS

Please amend claim 1 as follows:

1. (Amended) Providing a method of reducing dry-etch cleaning chamber particle count at the end of power-down for said dry-etch chamber, comprising:

providing a dry-etch cleaning chamber, said dry-etch cleaning chamber having been provided with an Inductive Coupled Plasma (ICP) coil;

positioning a workpiece within said cleaning chamber; and following a dry-etch chamber power-down procedure whereby said power-down is applied in a controlled and gradual manner, assuring reduced chamber particle count at the end of power-down of the dry-etch cleaning chamber.